

A Century of Service to the Nation

Volume 10 | Issue 10 | October 2025

Inside this issue

- 2 Notification on the R&D
- 3 Members in the News
- 3 Notification for 40th Indian Engineering Congress
- 4 Notification for IEI Awards — SAIL Award, Dr M Visvesvaraya Award and Coal India (J G Kumaramangalam Memorial) Award
- 5 Notification for IEI Industry Excellence Award 2025
- 6 Publication by Members
- 6 Notification for IEI Engineering Education Excellence Award 2025
- 7 Notification for Corporate Air Ticketing for IEI Members
- 8 Notification for Professional Engineers (PE) Certification by IEI — A Pathway towards Success
- 9 Notification — Be Proud to be a Certified International Professional Engineers (IntPE) by IEI
- 10 IEI-Springer Journals
- 11 Notification for Discount at the Samsung e-store for IEI Corporate Members
- 12 Articles Published in Latest Issue of IEI Journals
- 12 Notification for Know-Your-Member (KYM)
- 21 Announcements on IEI Industry Excellence Award 2025 and IEI Engineering Education Excellence Award 2025
- 23 Nota Bene
- 27 Notification for Advertisement in IEI Epitome
- 28 Continuing Professional Development Programmes of ESCI

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Er VB Singh

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**IEI
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TOME**

Notification on the R&D

Volume 10 | Issue 10 | October 2025

IEI R&D Grant-in-Aid

To promote appropriate technology, assist in building up design & research talents and, most importantly, to help in nurturing potential R&D venture amongst engineering students pursuing Diploma/UG/PG/PhD courses, The Institution of Engineers (India) has instituted the R&D Grant-in-Aid programme way back in 2001.

Like every year, the Institution invites applications for the session 2025-26 for funding industry-oriented R&D projects and research initiatives aimed at improving the lifestyle of common people from engineering students pursuing full-time Diploma/UG/PG/PhD engineering programme in AICTE/UGC/NAAC approved Institutions/Colleges/Universities. The application form and guidelines are available on our website <https://www.ieindia.org>. The projects should be carried out under the guidance of faculty members who are Corporate Members of IEI. Membership criteria for student investigator(s), guide(s) and Institution(s) are as follows:

Project Category	Student/Applicant Membership	Guide(s) Membership	Institutional Membership	Quantum of Grant (INR)
1. Diploma	Exempted [Membership of Student Chapter is desirable]	AMIE/MIE/FIE	Not Mandatory	Not exceeding ₹15,000/- for a single project
2. UG (BE/ BTech/ AMIE/ Equivalent)	SMIE	AMIE/ MIE/ FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation	Not exceeding ₹50,000/- for a single project
3. PG (ME/ MTech/ Equivalent)	AMIE/ MIE/ FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation	Not exceeding ₹1,00,000/- for a single project
4. PhD	AMIE/ MIE/ FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation	Not exceeding ₹1,50,000/- for a single project

The soft copy of the duly filled-up applications (in editable format), as per the pro-forma available in our website www.ieindia.org, should be sent through email to research@ieindia.org and one printed copy of the same should reach the following address:

The Deputy Director (Technical)

The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020

Applications received in format other than that available on our website will not be accepted. Application should be forwarded through the Guide, Head of the Department or Head of the Institution. Please note that preference will be given to project proposals received from Institutions who are Members of The Institution of Engineers (India) and with NBA / NAAC Accreditation. Kindly go through the guidelines (visit link <https://shorturl.at/BiAOQ>) carefully before filling up the application.

The grant is not intended for the faculty members / working individuals who have access to other avenues of research funding. Proposals received will be scrutinized and the recipients of R&D Grant will be informed accordingly.

Members in the News

Volume 10 | Issue 10 | October 2025



Er Ashok Kumar Basa, FIE

Past President, IEI & Managing Director
CEM Engineers & Consultants (P) Ltd., Bhubaneswar, Odisha
✉ akb.beb@gmail.com

Er Ashok Basa was bestowed upon the prestigious **Vivesvaraya Award - 2025** by Odisha Engineers' Forum on 15 September 2025 on the occasion of Engineers' Day held in Sharala Bhavan Cuttack in presence of Chief Guest Er Soumendra K Priyadarshi, IPS, ADG Police and CMD Odisha Police Housing Corporation and Er Kedar Ranjan Pandu, MD, OPGC.



Er C Debnath, FIE

Past President, IEI & Former Superintending Engineer (Building)
Public Works Department, Government of Tripura
✉ cdnagt@gmail.com

Er C Debnath has been re-elected from Tripura unanimously as **National President** of Indian Buildings Congress (IBC) (a professional organization connected with built Environment having HQ at New Delhi) for the session 2025-26.



Dr Sundara Rao NVVS Badam, FIE

CEO
Sundar Associates, Andhra Pradesh
✉ badamsundararao@gmail.com

Dr Sundara Rao NVVS Badam received the **Doctor of Philosophy (Ph.D.)** degree in Civil Engineering from Jawaharlal Nehru Technological University Kakinada, Andhra Pradesh on 04 July 2025 on the thesis entitled 'An Investigation on Strengthening Structural Elements of Various Grades of Concrete Adopting Different Techniques'.



40th Indian Engineering Congress

19-21 December 2025

Theme

Innovative Engineering Solutions for Viksit Bharat @ 2047

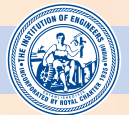
Organized by

The Institution of Engineers (India)

Hosted by

Durgapur Local Centre

For details, please click on: <https://40iec.org/>



Members in the News

Volume 10 | Issue 10 | October 2025



Prof Dr Ashok Kumar Dua, FIE

Independent Researcher

All India Management Association (AIMA), Aligarh Muslim University (AMU) PhD Program

✉ dua.ashokk@gmail.com

Prof Dr Ashok Kumar Dua received the **Ivey Bestseller Award** in recognition of the case ‘Ratan Tata: Ethical Leadership’ for the 2024-2025 year on June 2025.



Dr Vinod Kumar, MIE

Manager

SJVN Limited, Shimla, Himachal Pradesh

✉ vinod_chauhan20428@yahoo.co.in

Dr Vinod Kumar received the **Doctor of Philosophy (Ph.D.)** degree in Management from Chitkara University, Punjab on 20 September 2025 on the thesis entitled ‘Understanding the Influence of Leadership and Organizational Culture on Employee Task Performance: The Mediating Role of Engagement’.

IEI AWARDS

CALL FOR PAPERS

The Steel Authority of India Ltd (SAIL) had instituted two Awards, namely, **SAIL AWARD** and **DR M VISVESVARAYA AWARD** to be given away every year during the **Indian Engineering Congress** to author/s of the articles adjudged best on selected topics.

The topics for the year 2025 are given hereunder.

SAIL AWARD

Hydrogen-Based Steelmaking for Decarbonization

DR M VISVESVARAYA AWARD

Digitization and Digital Twins for Process Simulation

The Coal India Ltd (CIL) had instituted an Award to perpetuate the memory of Late J G Kumaramangalam, its first Chairman to be awarded every year during the Indian Engineering Congress to author/s of the articles adjudged best on a selected topic. The topic for the year 2025 is given below.

COAL INDIA (J G KUMARAMANGALAM MEMORIAL) AWARD

Energy Efficiency

The articles preferably restricting to 3000 words along with good quality photographs may be submitted along with a Declaration Form to award@ieindia.org within **14 November 2025**.

The template of the paper and the Declaration Form are available under the following link: <https://shorturl.at/vGxdc>.

Intending contributors are requested to send the soft copy of the paper by email to award@ieindia.org with subject heading “Papers for SAILAward/Dr MV Award/CoalAward” and submit four number printed copies of their articles to :

Deputy Director (Technical)

The Institution of Engineers (India),

8 Gokhale Road, Kolkata 700020

Members in the News

Volume 10 | Issue 10 | October 2025

The following esteemed Corporate Members were conferred with the prestigious Professional Engineer (PE) Certificate from IEI after successful completion of the assessment process and they have been authorised to use the style and title of P Eng (I) by virtue of expertise in their field:



Er Shubham, AMIE & PE7007871 (Certified Professional Engineer, IEI)
Associate Engineer, Atkins Realis, Karnataka
Field : Civil Engineering
✉ shubhamhanda40@gmail.com
Valid from: 12 September 2025; Valid up to: 30 September 2030



Er Thirumavalavan P, MIE & PE7007885 (Certified Professional Engineer, IEI)
Instrumentation Engineer, Qatar Energy, Doha, Qatar
Field : Electronics and Telecommunication Engineering
✉ thirurveda@yahoo.co.in
Valid from: 16 September 2025; Valid up to: 30 September 2030



Er Labh Singh Bhari, FIE & PE7007898 (Certified Professional Engineer, IEI)
Former Advisor (Telecom), Department of Telecom, Govt of India, Punjab
Field : Electronics and Telecommunication Engineering
✉ labhsingh@gmail.com
Valid from: 16 September 2025; Valid up to: 30 September 2030



Er Kathirvel N, MIE & PE70078901 (Certified Professional Engineer, IEI)
Technical Advisor – Kellogg Brown & Root Engineering and Construction India Pvt. Ltd., Chennai
Field : Mechanical Engineering
✉ nagappankathirvel@gmail.com
Valid from: 16 September 2025; Valid up to: 30 September 2030

IEI Industry Excellence Award 2025

Request for Participation

The IEI Industry Excellence Award has been instituted to recognize industry leaders for their innovation, excellence in engineering operations and thereby, to lead their industry in a competitive manner. The benchmarks created by the industries in India have included productivity, quality, safety and performance assurance thereby giving India the rightful place in the global markets. Realizing that such industries can provide the leadership to a large number of other industries in the country, it has been considered appropriate by the IEI Council to institute the IEI Industry Excellence Awards in the year 2008.

Applications in specified format (visit link: <https://www.ieindia.org/webui/IEI-Activities.aspx#industry-excellence-award>) are invited from prospective applicants for IEI Industry Excellence Award 2025. The last date of receipt of application for the Award is **16 November 2025**. Interested applicants are requested to send their applications (Two hard copies & One soft copy in USB drive) to the below mentioned address.

Deputy Director (Technical)
The Institution of Engineers (India),
8 Gokhale Road, Kolkata 700 020

Publication by Members

Volume 10 | Issue 10 | October 2025

Books



Er Dr Prof A O Surendranathan, FIE
Retired Professor
National Institute of Technology Karnataka, Surathkal
✉ aos_nathan@yahoo.com

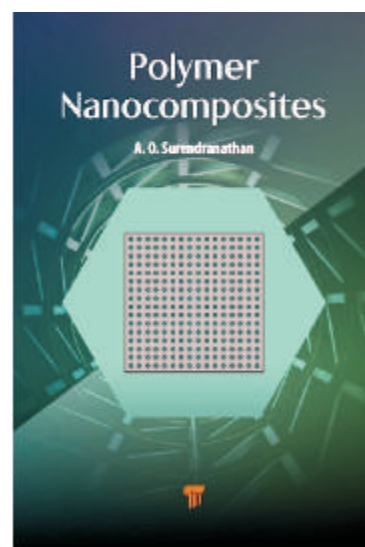
Polymer Nanocomposites

About the Book:

Polymer nanocomposites are polymer-based composites in which the reinforcement is in nano size. The nano size provides tremendous surface area for the unit weight of the material, and thus the matrix-reinforcement contact area increases tremendously. The properties of a composite depend on the amount of this contact area. The larger the contact area, the greater the property improvement. Thus, the knowledge of polymer nanocomposites is important for their proper use in applications. This book provides such knowledge. It discusses all the aspects of polymer nanocomposites, namely, their synthesis, characterization, properties, and applications. It covers general as well as specific polymer nanocomposites, throws light on recent research and development, and describes current and prospective applications.

Details of the Book:

ISBN (Hardcover) : 978-981-5129-53-3
ISBN (eBook) : 978-1-003-64623-5
Published : August 2025
Subject : Industrial Chemistry
Publisher : Jenny Stanford Publishing Pte. Ltd., Singapore



IEI Engineering Education Excellence Award 2025

Request for Participation

The IEI Engineering Education Excellence Award has been instituted to recognize leading Engineering Educational Institutions and encourage better and more effective engineering education across the country. The engineering education sector has witnessed significant development, setting benchmarks for others to follow. Universities and institutions have expanded their scope beyond pedagogy and now engage in R&D activities, consultancy, patents, publications, skill development programmes, industry interface, and the implementation of the New Education Policy (NEP), contributing to India's global prominence. Recognizing that such institutions can lead and inspire numerous others in the country, the IEI Council has decided to establish the IEI Engineering Education Excellence Awards.

Prospective applicants are invited to submit their applications in the specified format (visit link: <https://www.ieindia.org/webui/IEI-Activities.aspx#engineering-education-excellence-award>) for the IEI Engineering Education Excellence Award 2025. The deadline for submission of applications for the Award is **16 November 2025**. Interested applicants are requested to submit their applications (Four hard copies & One soft copy in Pen Drive/CD) to the below mentioned address.

Deputy Director (Technical)
The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020

Publication by Members

Volume 10 | Issue 10 | October 2025



Dr Abhishek Dwivedi, MIE

Assistant Professor

Department of Mechanical Engineering, Integral University Lucknow, Uttar Pradesh

✉ abhishekdwi2003@hotmail.com

Manufacturing Processes

Metal Forming, Machining, Metal Casting, Welding and Additive Manufacturing

Co-Authors: Mahmood Alam, Anshuman Srivastava, and Ajay Kumar Mishra

About this Book:

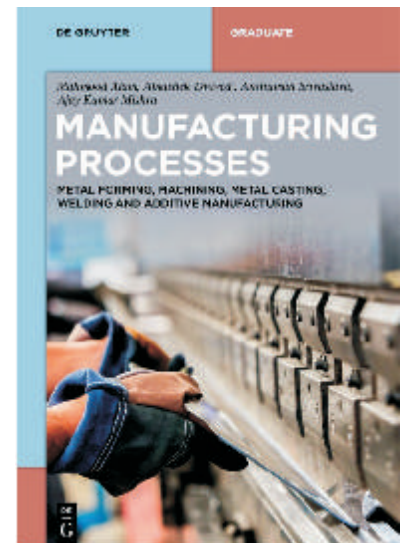
Manufacturing has always been an important part of the industrial environment, enabling the production of products for the service of mankind. The knowledge of manufacturing practices is highly essential for all engineers and technocrats to familiarize themselves with modern concepts of manufacturing technologies. The primary purpose of this manuscript is to provide theoretical and practical knowledge of manufacturing processes to all first-year engineering students across all branches, as well as second- and third-year students, to help them recall the basics and deepen their understanding of manufacturing science. This book offers a concise overview of essential manufacturing processes, providing readers with a foundational understanding of the methods used to transform raw materials into finished products. It covers traditional techniques such as casting, forming, and machining, alongside modern methods like additive manufacturing. By exploring both the theoretical and practical aspects of these processes, the book serves as a valuable resource for students, engineers, and professionals in the manufacturing industry. Whether you are new to the field or seeking to refresh your knowledge, this guide will equip you with the insights needed to navigate the world of manufacturing.

This book covers most of the syllabus of manufacturing processes and technology for engineering diploma and degree classes as prescribed by different universities and state technical boards. While preparing the manuscript of this book, the examination requirements of engineering students have also been kept in mind by including practice test questions. The book is written in very simple language so that even an average student can easily grasp the subject matter. Some comparisons are provided in tabular form, and emphasis has been placed on figures to enhance understanding of tools, equipment, machines, and manufacturing setups, ranging from traditional to advanced manufacturing, as used in various manufacturing shops.

The author strongly believes that the book will serve not only as a text book for students of the engineering curriculum but also as a reference material for engineers working in manufacturing industries.

Details of the Book:

ISBN : 978-3-11-914753-8
e-ISBN (PDF) : 978-3-11-220589-1
e-ISBN (EPUB) : 978-3-11-220628-7
DOI : <https://doi.org/10.1515/9783112205891>
Published on : 22 August 2025
Publisher : Walter de Gruyter GmbH, Berlin



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Corporate Members may book Corporate Air Ticket through M/s EBIX Travels Private Ltd. For details please visit

<https://www.ieindia.org/webui/IEI-AirTickets.html>

Publication by Members

Volume 10 | Issue 10 | October 2025

Book Chapter



Er Ashok Kumar Panda, FIE

Superintending Engineer

Military College of Electronics and Mechanical Engineering, Secunderabad

✉ akp.eme@gmail.com

Title of Book Chapter: Indigenization for Indian Defense Forces: Opportunities & Challenges of Smart Materials

Chapter 36, Recent Trends in Engineering, Science and Technology, Taylor & Francis Group, CRC Press, London, 1st Edition, 19 August 2025, ISBN: 9781041121619 (hbk), ISBN: 9781041121633 (pbk), ISBN: 9781003663348 (ebk)

URL: <https://www.taylorfrancis.com/chapters/edit/10.1201/9781003663348-36/indigenization-indian-defense-forces-opportunities-challenges-smart-materials-ashok-kumar-panda>

Abstract: The spending of Indian Defense agencies is closely 3% of gross domestic product of the nation and nearly 40% of total allocation is spent on indigenization activity. Both the aspects determine the self-reliance index which is the ratio of expenditure on indigenization to the total expenditure on defense in a financial year. The index for India is currently close to 0.5 against a world average of 3. The rank of India is four amongst 12 Indo Pacific nations in reference to self-reliance in defense sector. The critical overview reflects that opportunity and challenges of smart and modern materials are fundamental factors for success in defense Indigenization since most budgets is involved in procurement, process, research, development and testing of smart and exclusive materials used in customized manner for armed forces. Ongoing global military activities and ambitious program of Atmanirbhar Bharat in defense, India is in a tight spot to avail all opportunities in indigenization sector and mitigate challenges to deliver field requirements in totality by 2030 indigenously. It is established that close to 80% of defense engineering indigenization activities are subject of material innovation either in raw form or semi processed or ready to use off the shelf. However, the most challenge is specification determination as per user requirements, maintaining global standards and to meet qualitative requirements. With an aim to make India a negative import country by 2047 the Indigenization program is focusing on applications of Rare Earth Materials, Meta Materials, Ceramic Matrix Composites and epsilon negative materials as opportunities. The challenges of importing and exploiting smart materials to support the program are taken care by multiple agencies proactively.

Professional Engineers (PE) Certification by IEI — A Pathway towards Success

Get the **Professional Engineers Certification** by IEI to enhance your knowledge, skill and competency and also elevate your career by becoming a member of an elite group of engineers.

Who can be a Professional Engineer —

- Having Bachelor's Degree in Engineering or equivalent recognized by Statutory Authority or Government of India;
- Having experience of at least 5 years in engineering practice.

Why become a Professional Engineer (PE) —

- Improved career prospects and employability;
- Makes you suitable to attain higher levels of authority and responsibility;
- It is envisaged that in future, only a professional engineer would be empowered to prepare, sign, seal and submit engineering plans and drawings to a public authority for approval, or to seal engineering work for public and private clients;
- With growing economy and large scale expansion of infrastructure, the demand of PE certified engineers are expected to be much higher.

How to apply for Professional Engineers?

The details are available on IEI Website

<https://shorturl.at/mRIYu>

or

scan the code



For any query and assistance, please send email to: pe@ieindia.org or contact (033) 40106275

Publication by Members

Volume 10 | Issue 10 | October 2025

Paper published in the Journals / Proceedings



Dr Somnath Mahato, MIE

Project Scientist III

Climate Research & Services, India Meteorological Department (IMD), Government of India

✉ somnathmahato1@gmail.com

Title of Paper: GPS Precise Point Position Technique's Usability for Improving Geodesy Applications

National Academy Science Letters, Springer, 17 June 2025, Electronic ISSN: 2250-1754, Print ISSN: 0250-541X

DOI: <https://doi.org/10.1007/s40009-025-01692-5>

Co-authors: Aravindh Subramanian Subramanian & Debipriya Dutta

Abstract: This paper investigates the single-point positioning capability of 18 International GNSS Service (IGS) stations globally, utilizing data from the NASA Crustal Dynamics Data Information System for the first 145 days of 2022. Employing the open source software for post-processing, the study assesses critical parameters at 4 h intervals, producing 3D graphs for visualizing dynamic positioning solutions. Benchmarking against Precise Point Positioning data from the Canadian Geodetic Survey allows a comparative analysis, revealing strengths and weaknesses in the single-point positioning method for each station. The findings offer targeted insights into the global distribution of precise positioning capabilities among IGS stations, aiding in station selection for geodetic research and GNSS applications worldwide. This research enhances the understanding of individual station performance, empowering informed decision-making for improved accuracy and reliability in GNSS positioning systems and contributing to the advancement of geodetic research.

Keywords: Geoinformatics; Geographical Information System; Geodesy; Metrology; Research Skills

Be Proud to be a Certified International Professional Engineers (IntPE) by IEI

Who can apply for International Professional Engineers?

Basic Requirements for certification as International Professional Engineer

- ◎ Bachelor's Degree in Engineering or equivalent recognised by Statutory Authority or Government of India;
- ◎ Experience of 7 years in engineering practice. Out of 7 years of experience 2 years in a responsible position of significant engineering activity.

How to apply for International Professional Engineers?

For details
please visit the link:
<https://shorturl.at/j36fo>
or
scan the code →



Why become an International Professional Engineer ?

International Professional Engineer (Int.PE) Certification enables engineering professionals to advance their career aspiration in wide ranging ways.

- ◎ The International Professional Engineers, registered with IEI, may receive credit when seeking registration or licensure in the jurisdiction of another member i.e this will facilitate an engineer in mobility across member jurisdictions;
- ◎ Empowered by International Professional Engineers Agreement (IPEA), IEI maintains the Register of International Professional Engineers (IntPE) in India;
- ◎ Enhances an engineering professional's stature and gives confidence to employer/ prospective employer about competency of Certified Engineer;
- ◎ IntPE Certificate facilitates an engineer in Professional Mobility.

For any query and assistance, please send email to: pe@ieindia.org or contact (033) 40106220

Publication by Members

Volume 10 | Issue 10 | October 2025



Dr Abhijit Mukherjee, FIE

Associate Professor

Department of Fashion Technology, National Institute of Fashion Technology, Salt Lake, Kolkata, West Bengal

✉ abhijit.mukherjee@nift.ac.in, drprofabhijit@gmail.com

Title of Paper: **Recycling and Upcycling of Synthetic Textile Fibres: Paving a New Path of Sustainability**

Wisdom Journal of Science and Technology, Wisdom Consulting Services, Bengaluru, 1(1), June 2025, pp 17-27, Online ISSN: 3107-5851

DOI: <https://doi.org/10.64848/WJST.1.1.2025.17-27>

Co-author: Raj Kumar

Abstract: The rapid speed of technological innovation and the fast development of quick fashion have deepened global environmental problems, especially because of the massive increase in waste from fashion. Among them, synthetic fibres — mainly made of oil-based polymers like polyester, nylon, and acrylic — are in the great majority. While inexpensive and durable, such fibres are responsible for an enormous contribution to environmental degradation since they cannot be decomposed biologically. This review considers developing methods of recycling and upcycling synthetic textile fibres involving mechanical, chemical, and biotechnological processes and evaluating their potential for a circular textile economy. Although mechanical recycling is practised, it causes fibre degradation over time. In contrast, chemical processes such as glycolysis and depolymerization provide high-purity products at the cost of high energy and financial inputs. However, biotechnological solutions, namely enzymatic recycling through fungal lipases and bacteria, offer an environment-friendly solution, although scalability and infrastructure are currently humongous setbacks. The convergence of digital technologies like AI, blockchain, and IoT has become a game-changing solution, enhancing sorting, traceability, and lifecycle management in textile supply chains. This review also addresses the role that supportive policy landscapes like Extended Producer Responsibility (EPR) and the European Green Deal, a set of policy initiatives by the European Commission to make the EU's economy sustainable, can play in encouraging companies to make changes and innovate approaches to managing waste. Also welcomed is the advent of biodegradable and bio-based synthetic fibres and hybrid blends created to allow for disassembly, which marks hopeful developments for reducing virgin material dependence. In total, recycling and upcycling of man-made fibres not only reduce the amount of waste that goes to landfills but also present the potential for generating value-added products. This article highlights the importance of collaboration across sectors, public education, and technological breakthroughs to overcome the current constraints. By doing this, the textile industry can steer towards a sustainable, resilient, and environmentally conscious future.

Keywords: Recycling Textile Waste; Technological Advancement; Synthetic Fibres; Biochemical Recycling; Textile, Circular Fashion; Biodegradable



IEI-Springer Journals



ISSN Print 2250-2149
ISSN Electronic 2250-2157

Series A

CiteScore 2024
2.8

Google Scholar: h5 Index 2023
22

ISSN Print 2250-2106
ISSN Electronic 2250-2114

Series B

CiteScore 2024
3.9

Google Scholar: h5 Index 2023
24

ISSN Print 2250-0545
ISSN Electronic 2250-0553

Series C

CiteScore 2024
2.7

Google Scholar: h5 Index 2023
24

ISSN Print 2250-2122
ISSN Electronic 2250-2130

Series D

CiteScore 2024
2.5

Google Scholar: h5 Index 2023
19

ISSN Print 2250-2483
ISSN Electronic 2250-2491

Series E

CiteScore 2024
2.8

Google Scholar: h5 Index 2023
11

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Publication by Members

Volume 10 | Issue 10 | October 2025



Dr Kirti Jalgaonkar, MIE

Senior Scientist

ICAR-Central Institute for Research on Cotton Technology, Mumbai, Maharashtra

✉ jalgaonkar.kirti@gmail.com

Title of Paper: Application of Natural Plant Fibres in Development of Sustainable Concrete: A Review

Journal of Scientific & Industrial Research (JSIR), 84(8), 2025, ISSN: 0022-4455, e-ISSN: 0975-1084

LINK: <https://or.nisicpr.res.in/index.php/JSIR/article/view/12276>

Co-authors: G Krishna Prasad, Manoj Kumar Mahawar, T Senthilkumar, Ajinath Dukare, Naveen Kumar Jha, Sharmila Patil, Jyoti Dhakane-Lad & P Jagajanantha

Abstract: Concrete is the most prevalent material used for construction purposes. The steel reinforcement is often done to provide tensile strength and ductility to the buildings. There are environmental concerns related to the manufacturing process of reinforced concrete structures, including carbon dioxide emission, alongside the problem of corrosion of the steel reinforcement. Natural plant fibers have gained significant attention in recent years as sustainable alternatives due to renewable, energy-efficient, improved flexural strength, reduced environmental impact, enhanced workability, cost-effectiveness, aesthetic appeal, and compatibility with existing infrastructure. Utilization of natural fibres has limitations, including higher moisture absorption rate and hydrophilicity, which is correlated with a reduction in compressive, tensile, and flexural strength. In addition, long-term durability issues, viz., increased shrinkage and swelling, reduce the overall performance compared to the synthetic fiber-reinforced concrete. Despite these constraints, continued research efforts are aimed at overcoming these challenges through improved fiber treatments, modified concrete formulations, and enhanced construction practices to maximize the features of natural fibers in concrete applications. This review aims to present a comprehensive compilation of the utilization of natural fibres in the development of sustainable concrete.

Keywords: Concrete Applications; Environmental Impact; Fiber-reinforcement; Reinforced Concrete; Sustainable Concrete

Title of Paper: PBAT-Based Nanocomposite Blown Films: A Green Alternative for Packaging of Peeled Garlic

Polymer, Elsevier, 337, 27 October 2025, 129025, Print ISSN: 0032-3861, Online ISSN: 1873-2291

DOI: <https://doi.org/10.1016/j.polymer.2025.129025>

Co-authors: Sharmila Patil, Ashok Kumar Bharimalla, Manoj Kumar Mahawar, Jyoti Dhakane-Lad & A.S.M. Raja

Abstract: The extensive use of petroleum-based plastics in food packaging has led to severe environmental pollution, necessitating eco-friendly and sustainable alternatives. This study focused on developing biodegradable packaging films with functional properties comparable to conventional packaging. A nanocomposite blend (CNC-PPT) comprising of poly (butylene adipate-co-terephthalate) (PBAT), poly (lactic acid) (PLA), and thermoplastic starch (TPS), reinforced with cellulose nanocrystals (CNC) derived from cotton linters was formulated. The CNC-PPT films were produced via melt compounding followed by blown film extrusion and evaluated against low-density polyethylene (LDPE) films. Though LDPE demonstrated slightly superior mechanical properties, CNC-PPT films showed comparable performance in most aspects. The tensile strength, elongation at break, elasticity modulus, and bursting strength of CNC-PPT films were 10.51 MPa, 168.10%, 0.87 GPa, and 191 kPa, respectively. CNC reinforcement improved the mechanical and barrier performance of composite films. Notably, CNC-PPT films exhibited superior oxygen barrier properties, with an oxygen transmission rate (OTR) of 51.52 cm³ mm/m²·day, significantly ($p < 0.05$) lower than LDPE (212.15 cm³ mm/m²·day). However, they had higher water vapor permeability (1.209 g mm/m²·day·kPa) than LDPE. Storage studies showed that peeled garlic packed in CNC-PPT films had lower weight loss (10.04%), higher pyruvic acid retention (4.28 μmol/g), less color deterioration, and reduced microbial growth after 8 days compared to LDPE. The moderate moisture permeability of CNC-PPT films minimized condensation inside the package, while their high oxygen barrier prevented microbial spoilage and preserved garlic quality, extending shelf life. These findings establish CNC-PPT films as a promising eco-friendly alternative for packaging perishables, offering both environmental and product quality benefits.

Keywords: Cotton Linters; Cellulose Nanocrystals; Blown Film Extrusion; Mechanical Strength; Barrier Properties; Peeled Garlic; Microbial Quality

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Pages: 665–677

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Department of Civil Engineering, National Institute of Technology Silchar, Silchar, 788010, Assam, India

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Page: 679–694

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Department of Civil Engineering, College of Engineering Trivandrum, Thiruvananthapuram, 695016, Kerala, India

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Department of Computer Science and Engineering, University of Visvesvaraya College of Engineering (UVCE), Bangalore University, Bengaluru, 560001, Karnataka, India
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Pages: 773–787
Title: **Flexural Behaviour of Quaternary Blended Reinforced Concrete Beams Under Elevated Temperatures**
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Online Publication Date: 03 June 2025
Pages: 789–795

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Pages: 907–927

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Title: **TSRP: A Novel Trust-Based and Energy-Aware Secure Routing Protocol for Resource-Constrained Wireless Sensor Networks**
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Title: **Effectiveness of Multilayer Perceptron for Indoor Localization in Wi-Fi Enabled IoT Environments**
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Online Publication Date: 09 October 2024
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Online Publication Date: 01 November 2024
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Title: **TLGT: Two-Level Game Theory Model for an Energy-Efficient Cluster- Head Selection and Data Transmission in WSN**
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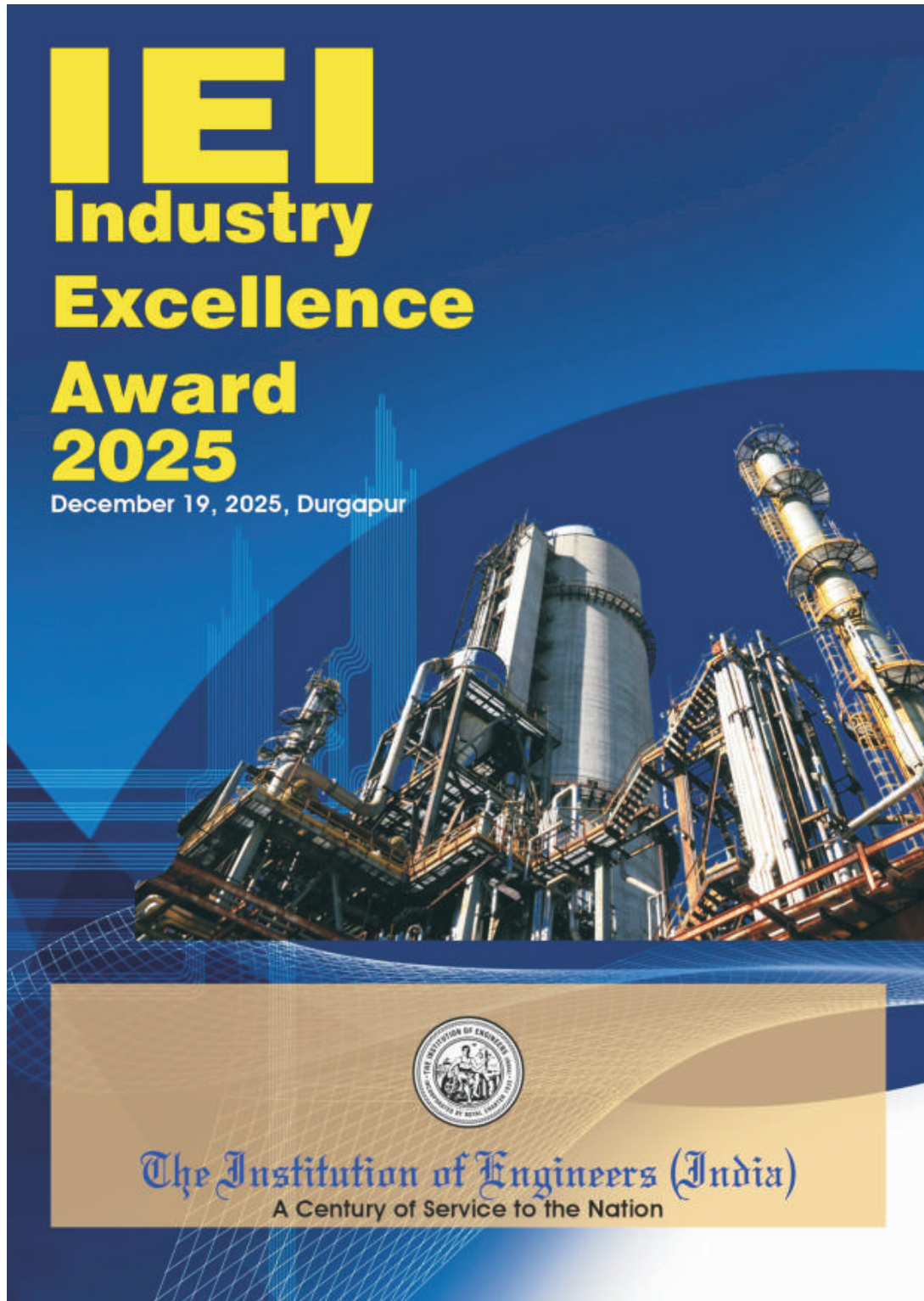
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Volume 10 | Issue 10 | October 2025


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Department of Computer Engineering and Technology, School of Computer Science and Engineering, Dr. Vishwanath Karad MIT World Peace University, Pune, India
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Volume 10 | Issue 10 | October 2025



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December 19, 2025, Durgapur

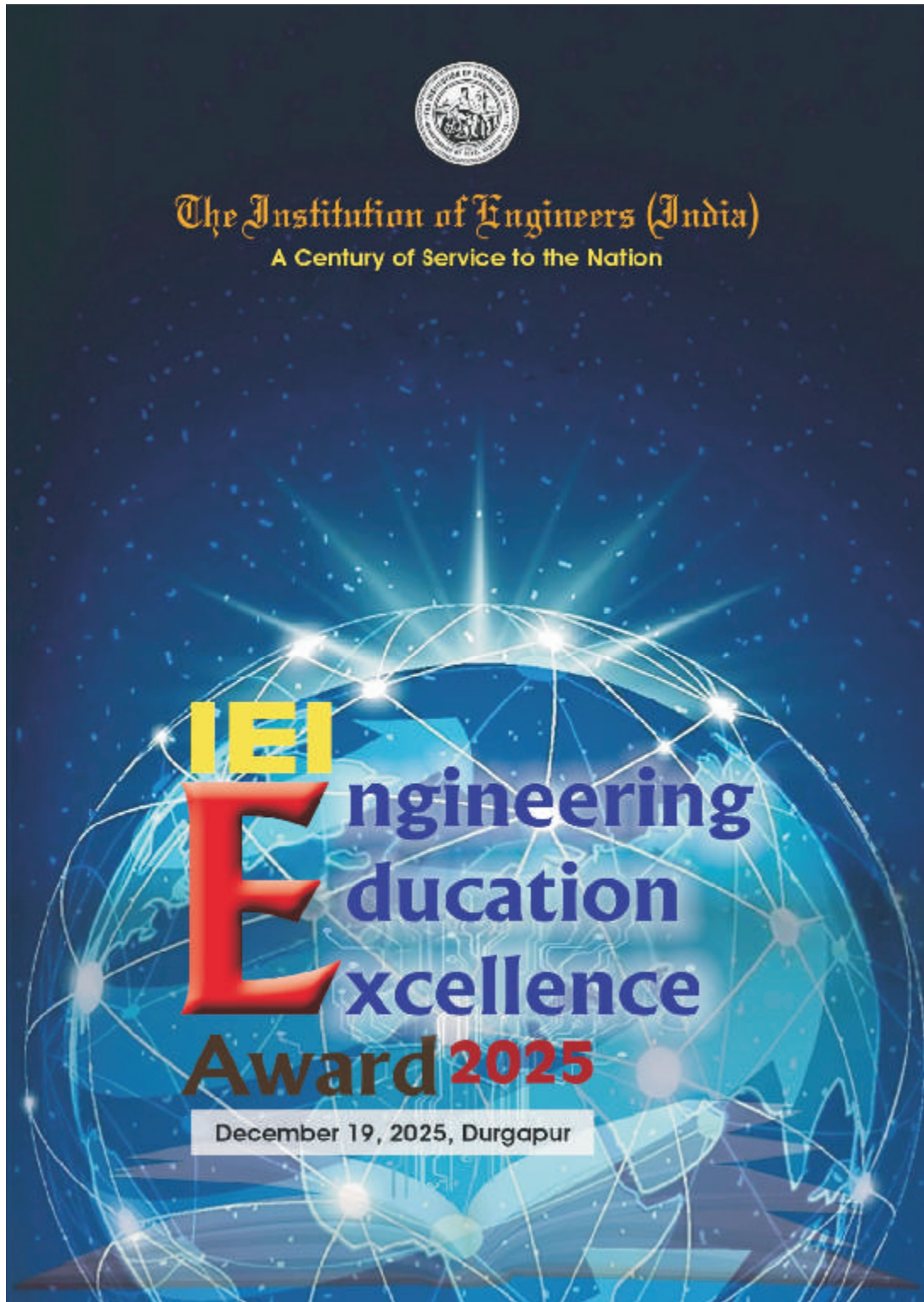


The Institution of Engineers (India)
A Century of Service to the Nation

For details, please click here: <https://shorturl.at/bDnwX>

Announcements

Volume 10 | Issue 10 | October 2025



For details, please click here: <https://shorturl.at/HWRWY>

Nota Bene

Volume 10 | Issue 10 | October 2025

We would like to thank our erudite members for sharing their professional achievements through the IEI Epitome and making the content more abounding and at the same time inspiring many others to share their accomplishments as well. To streamline the process and make it convenient for the member to give their inputs we would like to obtain the information in a more structured and comprehensive manner. We would request our members to send the details of their achievements as per the appended formats only.

FORMAT FOR ACHIEVEMENT BY MEMBERS

A passport size
color photograph
(scanned image)

(i) Prefix (Er/Dr/Prof)	
(ii) First Name	
(iii) Middle Name (if any)	
(iv) Surname (Last Name)	
(v) Email and Mobile Number	
(vi) Designation	
(vii) Organization of affiliation	
(viii) Membership No (please use the prefix F/M/AM as the case may be)	
(ix) Details of Award/Achievement#	
(x) Month & Year of Achievement/ Date of Achievement	
(xi) Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	

#Reporting of Award of stipend/fellowship at PG/PhD level and awards from esoteric events/communities may be avoided

Nota Bene

Volume 10 | Issue 10 | October 2025

FORMAT FOR PATENT / DESIGNS / TRADE MARKS / GEOGRAPHICAL INDICATIONS BY MEMBERS

A passport size
color photograph
(scanned image)

(i) Prefix (Er/Dr/Prof)	
(ii) First Name	
(iii) Middle Name (if any)	
(iv) Surname (Last Name)	
(v) Email and Mobile Number	
(vi) Designation	
(vii) Organization of affiliation	
(viii) Membership No (please use the prefix F/M/AM as the case may be)	
(ix) Tick the appropriate BOX	<input type="checkbox"/> Patent <input type="checkbox"/> Designs <input type="checkbox"/> Trade Marks <input type="checkbox"/> Geographical Indications
(x) Issuing Authority	
(xi) Serial No	
(xii) Patent No	
(xiii) Date of filing (DD/MM/YYYY)	
(xiv) Date of Grant (DD/MM/YYYY)*	
(xv) Patentee	
(xvi) Details of Patent	
(xvii) Term for which the above (ix) has been granted	

* Copy of Certificate of the Grant of Patent

Nota Bene

Volume 10 | Issue 10 | October 2025

FORMAT FOR PUBLICATION(S) BY MEMBERS — PAPERS

A passport size
color photograph
(scanned image)

(i) Prefix (Er/Dr/Prof)	
(ii) First Name	
(iii) Middle Name (if any)	
(iv) Surname (Last Name)	
(v) Email and Mobile Number	
(vi) Designation	
(vii) Organization of affiliation	
(viii) Membership No (please use the prefix F/M/AM as the case may be)	
(ix) Title of Paper	
(x) Name of Journal/Proceeding/Technical Volume	
(xi) Volume No (Not required for Indian Engineering Congress)	
(xii) Issue No (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xiii) Theme (Only for Technical Volumes of IEI)	
(xiv) DOI: (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xv) ISSN	
(xvi) Date of Publication (Date-Month-Year)	
(xvii) Co-authors (if any)	
(xviii) Abstract in full	
(xix) 5/6 Keywords	
(xx) Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	

Note: Publications in local seminar, conference and symposia will not be accounted

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Volume 10 | Issue 10 | October 2025

FORMAT FOR PUBLICATION(S) BY MEMBERS — BOOKS/ BOOK CHAPTERS

A passport size
color photograph
(scanned image)

(i) Prefix (Er/Dr/Prof)	
(ii) First Name	
(iii) Middle Name (if any)	
(iv) Surname (Last Name)	
(v) Email and Mobile Number	
(vi) Designation	
(vii) Organization of affiliation	
(viii) Membership No (please use the prefix F/M/AM as the case may be)	
(ix) Title of Book	
(x) Title of Book Chapter	
(xi) Book Chapter Number	
(xii) Publisher Details	
(xiii) ISBN	
(xiv) Date of Publication (Date-Month-Year)	
(xv) Co-authors (if any)	
(xvi) About the book (100-150 words)	
(xvii) Supporting Documents (complimentary copies for IEI Headquarters)/links [which are clearly indicative of the incumbent's achievement(s)]	

Note: Accommodate works published in journals/reputed conference proceedings/books for the last one year

Notification for Advertisement in IEI Epitome

Volume 10 | Issue 10 | October 2025

The Institution of Engineers (India) reserves a coveted privilege in being the largest multi-disciplinary professional body of engineers encompassing 15 engineering disciplines with a Corporate membership of over 2.59 lakhs maintaining a national/international presence through hundred twenty four Centres and six Overseas Chapters, Fora and Organ (Engineering Staff College of India). The Institution has been disseminating the various information through IEI Epitome and other publications.

We would like to share with you that we are now providing the facility to advertise engineering / technical products/services, information brochures, recruitment notices etc. in our official publication portal IEI Epitome (12 issues - 196000 reach online). Besides, IEI Epitome is also uploaded on our website (www.ieindia.org) on a monthly basis and is accessible to all free of cost. Given its immense footprint in the engineering and technical diaspora spanning the globe, IEI with its distinguished heritage of a century provides you the ideal portal to connect with the National and International Engineering and Technical Community at very competitive rates. We invite you to take this unique and privileged opportunity to advertise and communicate your service and product portfolios under our prestigious banner and make us your brand emissaries in your promotional campaigns.

The booking form containing details of each publication, rates for the advertisements and the advertisement form are appended below.

BOOKING FORM

Publication	Description	Type	Rate (Rs.) including GST	Number of Issues / Volumes	Total (Rs.) including GST
IEI Epitome	Inside Full Page	Colour	30,000		
	Inside Half Page	Colour	15,000		
	Inside Quarter Page	Colour	8,000		

Less discount* @%

Total Cost of Advertisement

★ 5% discount for advertisement in 6 consecutive issues of IEI Epitome

★ 10% discount for advertisement in 12 consecutive issues of IEI Epitome

Payments to be made by Cheques / Drafts drawn in favour of "The Institution of Engineers (India)".

Cheque / Draft No. Drawn on

Date:

Mobile No.

Email:

GSTIN:

Signature with seal

* Payment can also be done Online through our website: www.ieindia.org, details of which will be provided at the time of Payment.

Continuing Professional Development Programmes of ESCI

Volume 10 | Issue 10 | October 2025



Engineering Staff College of India

Autonomous Organ of The Institution of Engineers (India)
(IMS [ISO 9001:2015, ISO 14001:2015, ISO 50001:2018, ISO 45001:2018]
ISO/IEC 17025:2017 Certified, AICTE & CEA Recognized Institution)

Continuing Professional Development Programmes (CPDP) for the Month of November 2025

Sl. No.	Name of the Course	Scheduled Dates
1.	Risk Management	03 - 05 Nov 25
2.	Heating, Ventilation and Air Conditioning (HVAC) Systems in different Industries	03 - 06 Nov 25
3.	Best Earthing Practices and Safety Measures in EHV Substation	04 - 07 Nov 25
4.	Cyber Security & Cyber Hygiene for IT / OT Officers	05 - 07 Nov 25
5.	Application of IoT, Remote Sensing, UAV, Technologies in Mining	10 - 12 Nov 25
6.	LiDAR Technology for Irrigation & Agriculture Sector	10 - 12 Nov 25
7.	Challenges & Opportunities in EVs, Charging Stations and Grid Infrastructure - Latest EV Govt. Policies	10 - 13 Nov 25
8.	Firewall & VPN Security Administration	10 - 14 Nov 25
9.	Precision Machining with MASTERCAM (CNC Programming): Mastering 2D & 3D Programming	10 - 14 Nov 25
10.	Water Audit and Software-Tools and Techniques	12 - 14 Nov 25
11.	FDP on Intellectual Property Rights (IPR) and Patenting	12 - 14 Nov 25
12.	AI Tools to Enhance Work Productivity (ChatGPT & Copilot Intergradation with MS Office Applications)	12 - 14 Nov 25
13.	E-Tendering and Condition of Contract for EPC /Turnkey projects	17 - 19 Nov 25
14.	Steam Boilers and Turbine System Operations (Maintenance, Troubleshooting, Heat Recovery and Optimization)	17 - 20 Nov 25
15.	ISO 9001:2015 QMS - Effective Implementation & Internal Auditor Training	17 - 20 Nov 25
16.	Contract Management and Arbitration in Engineering Projects	17 - 20 Nov 25
17.	Metallurgy for QC and Design Engineers	18 - 20 Nov 25
18.	Transmission Line Construction (Survey, Design of lines and construction practices)	18 - 21 Nov 25
19.	3-Day Conference on "Sustainable Practices in Mining"	19 - 21 Nov 25
20.	Evaluating Sustainability in Renewable Energy Systems	19 - 20 Nov 25
21.	Root Cause Analysis	24 - 26 Nov 25
22.	Conjunctive Groundwater Studies & Their Impact in Irrigation Projects	24 - 26 Nov 25
23.	Program Validation and Testing in Embedded System	24 - 27 Nov 25
24.	Pollution Prevention and Environmental Management Strategy	25 - 27 Nov 25
25.	CERC Regulations Including Tariff Regulations	25 - 28 Nov 25
26.	FDP on ICT Tools & E-Content Development	26 - 28 Nov 25

For detail information please click on <https://escihyd.org/>